

CLAIMS

- 1 1. A method for breaking a futile collection cycle in a train algorithm, wherein a
2 collection-set includes at least the oldest car in the oldest train, the method comprising
3 the steps of:
4 determining when a futile cycle has been entered,
5 identifying a car outside the collection-set in the oldest train, where the identified
6 car contains an object referenced from outside the oldest train,
7 adding the identified car to the collection to form an augmented collection-set,
8 and
9 collecting the augmented collection-set including scanning intervening cars.
- 1 2. The method of claim 1 further wherein the step of identifying includes the step of
2 using information about the references to objects in cars in the oldest train collected dur-
3 ing prior collections.
- 1 3. The method of claim 1 wherein the step of identifying includes the step of using
2 information about the references to objects in cars in the oldest train collected during the
3 current collection.
- 1 4. The method of claim 1 wherein the reference from outside the oldest train is a ref-
2 erence from a younger train.
- 1 5. The method of claim 1 wherein the reference from outside the oldest train is a ref-
2 erence from outside the generation.
- 1 6. The method of claim 1 wherein the step of determining comprises the steps of:
2 measuring the volume of the oldest train before a collection,
3 measuring the volume of the oldest train after a collection, wherein if no volume
4 reduction has been found, a futile collection cycle has been entered.

1 7. The method of claim 6 further comprising the steps of:
2 establishing a threshold for the number of times that a collection cycle has re-
3 sulted in no reduction in the volume of the collection set,
4 saving the number of times that a collection cycle has resulted in no reduction in
5 the volume of the collection set, wherein when the threshold is reached a futile collection
6 cycle has been entered.

1 8. The method of claim 7 further comprising the steps of:
2 tracking the number of times on a no progress counter that a collection cycle has
3 resulted in no reduction in the volume of the oldest train, and
4 comparing the no progress counter to the threshold.

1 9. A garbage collector using the train algorithm, wherein a collection set includes at
2 least the oldest car in the oldest train, and including means for breaking a futile cycle, the
3 collector comprising:
4 means for determining when a futile cycle has been entered,
5 means for identifying a car outside the collection-set in the oldest train, where the
6 identified car contains an object referenced from outside the oldest train,
7 means for adding the identified car to the collection to form an augmented collec-
8 tion-set, and
9 means for collecting the augmented collection-set including scanning intervening
10 cars.

1 10. The garbage collector of claim 9 further wherein the means for identifying in-
2 cludes means for using information about the references to objects in cars in the oldest
3 train collected during prior collections.

1 11. The garbage collector of claim 9 wherein the means for identifying includes
2 means for using information about the references to objects in cars in the oldest train
3 collected during the current collection.

1 12. The garbage collector of claim 9 wherein the reference from outside the oldest
2 train is a reference from a younger train.

1 13. The garbage collector of claim 9 wherein the reference from outside the oldest
2 train is a reference from outside the generation.

1 14. The collector of claim 9 wherein the means for determining comprises:
2 means for measuring the volume of the oldest train before a collection,
3 means for measuring the volume of the oldest train after a collection,
4 wherein if no volume reduction has been found, a futile collection cycle has been
5 entered.

1 15. The collector of claim 14 further comprising:
2 means for establishing a threshold for the number of times that a collection cycle
3 has resulted in no reduction in the volume of the collection set,
4 means for saving the number of times that a collection cycle has resulted in no re-
5 duction in the volume of the collection set, wherein when the threshold is reached a futile
6 collection cycle has been entered.

1 16. The collector of claim 9 further comprising:
2 means for tracking the number of times on a no progress counter that a collection
3 cycle has resulted in no reduction in the volume of the oldest train, and
4 means for comparing the no progress counter to the threshold.

1 17. A computer readable storage media comprising media containing instructions for
2 execution in a processor for the practice of a method for breaking a futile collection cycle
3 in a train algorithm, wherein a collection set includes at least the oldest car in the oldest
4 train, the method comprising the steps of:
5 determining when a futile cycle has been entered,
6 identifying a car outside the collection-set in the oldest train, where the identified
7 car contains an object referenced from outside the oldest train,

8 adding a found younger car to the collection to form an augmented collection set,
9 and
10 collecting the augmented collection set.

1 18. The computer readable storage media of claim 17 further comprising media con-
2 taining further instructions for the practice of a method comprising the step of identifying
3 includes the step of using information about the references to objects in cars in the oldest
4 train collected during prior collections.

1 19. The computer readable storage media of claim 17 further comprising media con-
2 taining further instructions for the practice of a method comprising the step of identifying
3 includes the step of using information about the references to objects in cars in the oldest
4 train collected during the current collection.

1 20. The computer readable storage media of claim 17 wherein the reference from out-
2 side the oldest train is a reference from a younger train.

1 21. The computer readable storage media of claim 17 wherein the reference from out-
2 side the oldest train is a reference from outside the generation.

1 22. The computer readable storage media of claim 18 further comprising media con-
2 taining further instructions for the practice of a method comprising steps of:
3 measuring the volume of the oldest train before a collection,
4 measuring the volume of the oldest train after a collection,
5 wherein if no volume reduction has been found, a futile collection cycle has been
6 entered.

1 23. The computer readable storage media of claim 22 further comprising media con-
2 taining further instructions for the practice of a method comprising steps of:
3 establishing a threshold for the number of times that a collection cycle has re-
4 sulted in no reduction in the volume of the collection set,

5 saving the number of times that a collection cycle has resulted in no reduction in
6 the volume of the collection set, wherein when the threshold is reached a futile collection
7 cycle has been entered.

1 24. The computer readable storage media of claim 23 further comprising media con-
2 taining further instructions for the practice of a method comprising steps of:

3 tracking the number of times on a no progress counter that a collection cycle has
4 resulted in no reduction in the volume of the oldest train, and
5 comparing the no progress counter to the threshold.

1 25. Electromagnetic signals propagating on a computer network comprising electro-
2 magnetic signals carrying instructions to one or more processors for execution thereon for
3 the practice of a method for breaking a futile collection cycle in a train algorithm,
4 wherein a collection set includes at least the oldest car in the oldest train, the method
5 comprising the steps of:

6 determining when a futile cycle has been entered,
7 identifying a car outside the collection-set in the oldest train, where the identified
8 car contains an object referenced from outside the oldest train,
9 adding the identified car to the collection to form an augmented collection-set,
10 and
11 collecting the augmented collection-set including scanning intervening cars.

1 26. The electromagnetic signals propagating on a computer network of claim wherein
2 the step of identifying includes the step of using information about the references to ob-
3 jects in cars in the oldest train collected during prior collections.

1 27. The electromagnetic signals propagating on a computer network of claim wherein
2 the step of identifying includes the step of using information about the references to ob-
3 jects in cars in the oldest train collected during the current collection.

1 28. The electromagnetic signals propagating on a computer network of claim wherein
2 the reference from outside the oldest train is a reference from a younger train.

1 29. The electromagnetic signals propagating on a computer network of claim wherein
2 the reference from outside the oldest train is a reference from outside the generation.

1 30. The electromagnetic signals propagating on a computer network of claim 25 fur-
2 ther comprising electromagnetic signals carrying instructions for the steps of:
3 if no younger cars are found with objects referenced from younger trains, then
4 finding and adding a car with an external reference to the collection set to form a
5 second augmented collection set, and
6 collecting the second augmented collection set.

1 31. The electromagnetic signals propagating on a computer network of claim 25 fur-
2 ther comprising electromagnetic signals carrying instructions for the steps of:
3 measuring the volume of the oldest train before a collection,
4 measuring the volume of the oldest train after a collection,
5 wherein if no volume reduction has been found, a futile collection cycle has been
6 entered.

1 32. The electromagnetic signals propagating on a computer network of claim 31 fur-
2 ther comprising electromagnetic signals carrying instructions for the steps of::
3 establishing a threshold for the number of times that a collection cycle has re-
4 sulted in no reduction in the volume of the collection set,
5 saving the number of times that a collection cycle has resulted in no reduction in
6 the volume of the collection set, wherein when the threshold is reached a futile collection
7 cycle has been entered.

1 33. The electromagnetic signals propagating on a computer network of claim 25 fur-
2 ther comprising electromagnetic signals carrying instructions for the steps of:

3 tracking the number of times on a no progress counter that a collection cycle has
4 resulted in no reduction in the volume of the oldest train, and
5 comparing the no progress counter to the threshold.